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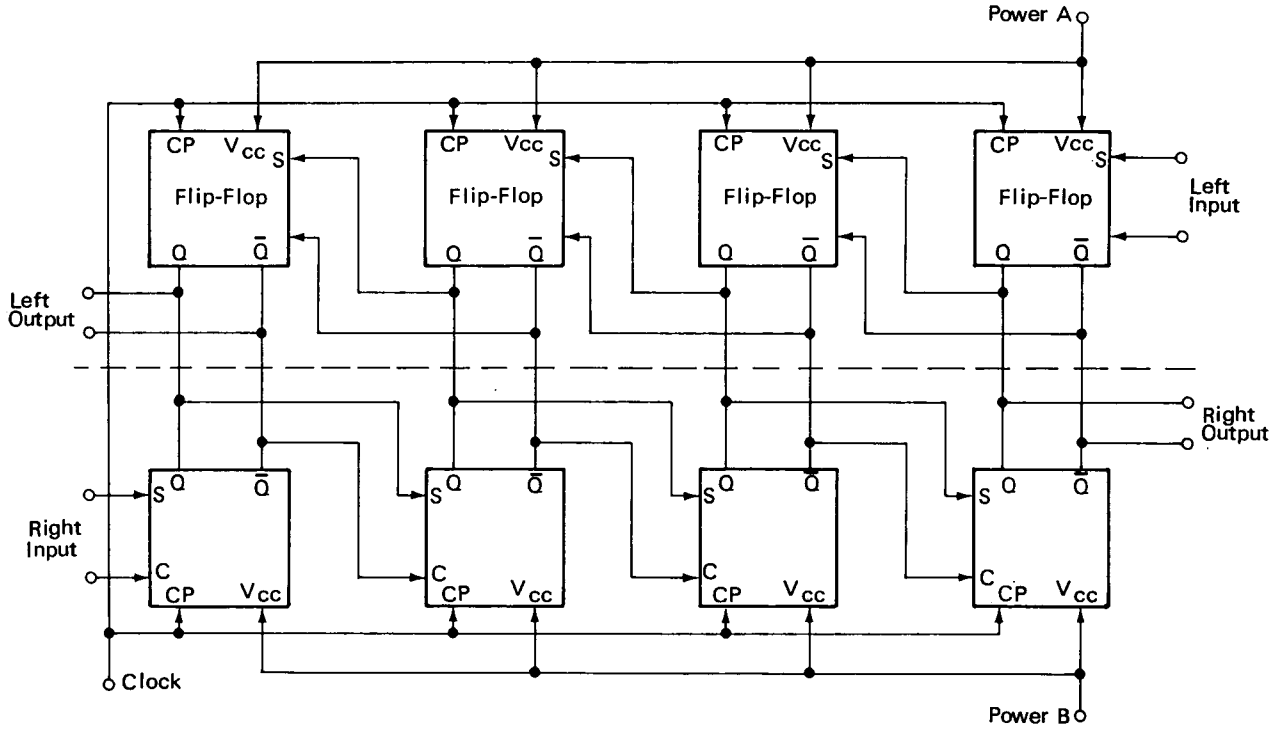
NASA TECH BRIEF

Goddard Space Flight Center

Novel Shift Register Eliminates Logic Gates and Power Switching Circuits

The right/left shift register shown in the block diagram transfers binary data between various storage registers in a digital computer without the need for complex power switching circuits and logic gates. Elimination of these circuit requirements reduces the weight and power requirements, and increases the reliability of the computer.



The register requires only two integrated circuits per stage and has a nominal power dissipation of 3.5 mW per stage. The entire register uses two-thirds the number of components and one-half the power of conventional versions. Significant advantages include: (1) elimination of a reset pulse, allowing data transfer to take place in a much shorter time interval—less than 1μ second; and (2) elimination of power application to both portions of the register simultaneously.

In operation, power is applied to either side of the register. When power is applied to the right-shifting (RS) register, the entire assembly acts as an

(continued overleaf)

RS register; serial data enters at the right input terminals and leaves at the right output terminals. When power is applied to the left-shifting (LS) register, an analogous sequence occurs. Conversion from right to left operation is achieved simply by switching the input power.

At the time of conversion, the data in the combined right/left register is unaltered. If the RS register is energized and one of its stages contains a "1," the Q output of that stage holds the Q output of the corresponding LS register stage at a positive potential. Similarly, the $\overline{Q}$ output of the RS register flip-flop holds the corresponding $\overline{Q}$ output of the LS register at ground potential. If the flip-flop of the RS register contains a "0," the potentials of Q and $\overline{Q}$ are reversed, but the mode of operation is the same.

Data transfer between registers is achieved by energizing the RS register and then de-energizing the LS register. Power need not be applied simultaneously to both registers in order to transfer the data because the residual capacitance in the flip-flops maintains the logic state while power is being switched.

Note:

No additional documentation is available. Specific questions, however, may be directed to:

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Patent status:

No patent action is contemplated by NASA.

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